CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 94 - 064

FINAL SITE CLEANUP REQUIREMENTS FOR:

UNITED TECHNOLOGIES CORPORATION,
(CHEMICAL SYSTEMS DIVISION - COYOTE CENTER)

OPERABLE UNIT 1

600 METCALF ROAD
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter called the Board), finds that:

1. Site Location. United Technologies Corporation (UTC), hereinafter also referred to as the discharger, owns and operates the Chemical Systems Division - Coyote Center in Santa Clara County as shown in Figure 1. The site is located in an unincorporated area of Santa Clara County approximately five miles south of San Jose and four miles east of U.S. Highway 101.

2. Site Description. The site is located in an area of rolling hills and relatively broad valleys. The two main valleys within the developed portion of the site are Shingle Valley and Mixer Valley. Elevations range from 680 to 1400 feet above mean sea level. Several creeks flow through the site which ultimately discharge into Anderson Reservoir.

3. Site History. UTC began on-site operation in 1959 and occupies 5,200 acres including over 200 stations used for laboratories, research, testing, manufacturing, storage, maintenance, and administration. The discharger develops, manufactures, and tests space and missile propulsion systems.

   Land usage in surrounding areas is zoned mostly for agricultural use. Ranch lands are located to the north, east, and southeast of UTC. To the northwest and west are two regional parks and some open public land. The nearest residences are a few ranch houses or other dwellings located within 3,000 feet to the north, northeast, and southeast of the site boundaries.

   Solid rocket motors are filled with propellants designed to cause a controlled oxidation reaction which releases large amounts of energy and gas. Solid rocket propellants are

typically synthetic rubber with reactive materials suspended in the rubber matrix. The typical materials used on-site are polybutadiene acrylic acid acrylonitrile terpolymers (PBAN), ammonium perchlorate, aluminum powder, and di-isocyanates. HMX and nitroglycerine are added to some propellants to enhance energy levels. Nonexplosive hazardous materials used in the operation include epoxies, paints, and insulating materials.

Degreasing agents consisting of chlorinated and non-chlorinated solvents (primarily trichloroethylene (TCE) and trichloroethane (TCA) have been widely used throughout the site to dissolve the highly adhesive PBAN polymer from mixing bowls and blades, and casting hardware. Historically, spent solvents were collected for evaporation in on-site surface impoundments or shipped off-site for recycling or disposal.

4. Study Area The UTC site has been divided into 7 investigative areas as shown in Figure 1 and as follows:

- Upper Shingle Valley & Research and Advanced Technology Area
- Middle Shingle Valley
- Lower Shingle Valley
- Mixer Valley
- Panhandle
- Motor Test Area
- Motor Assembly Area and Component Test Area

In this Order the site has been divided into 2 Operable Units as shown in the following table and Figure 2. Investigation in Operable Unit 1 which consists of Shingle Valley and Mixer Valley is essentially complete. Contamination originating from facilities in Operable Unit 2, which is essentially the remainder of the site, is still under investigation. The following table lists the Operable Units and their respective description:

OPERABLE UNIT	DESCRIPTION
1	Shingle Valley and Mixer Valley
2	Rest of the Site

The advantage of defining two operable units is that Operable Unit 1, where characterization work is essentially complete, may proceed with final cleanup without awaiting the results of further characterization work in Operable Unit 2.

5. Board Orders. The Board has adopted the following orders for the United Technologies Corporation, Chemical Systems Division:

. Waste Discharge Requirements, Order No. 80-61, adopted December 2, 1980

- Waste Discharge Requirements, Order No. 89-008, updated January 18, 1989.

- Water Reclamation Requirements, Order No. 91-006, adopted January 16, 1991

6. History of Site Investigations. The bulk of the investigation to date is included in the following reports: Source Identification and Characterization Reports Part I, Part II and the Supplementals dated November 1989, June 1990, and May 1991 respectively, RCRA Facility Investigation/Corrective Measure Study dated June 1991, and its addendum dated June 1993, and Human and Environmental Health Evaluation, Parts I & II dated November and December 1992.

   a. GEOLOGY. The site is located on unconsolidated recent alluvial deposits which are composed of poorly sorted stiff silts, clays, sands, and gravel. Within the silts and clays are lenses and layers of more permeable clayey sand, clayey gravelly sand, and gravel. Individual beds of more permeable sediment vary in thickness from a few inches to as much as ten feet. The alluvial valley fill thickens in the downstream direction from about 10 feet in the upper ends of the valleys to 30 feet or more in the lower portions of the valleys.

      Underlying the alluvium is the Santa Clara Formation, a late Pliocene to early Pleistocene formation consisting primarily of alluvial fan deposits. In general, the Santa Clara Formation consists of poorly consolidated gravel beds, sand and silt beds, some clay beds, bedded silt and rare tuff layers. At the UTC site the Santa Clara Formation is primarily mudstone with a few sand, and sandy gravel interbeds. Within the developed portion of the site, the Santa Clara Formation dips northeasterly and the valleys generally parallel the strike of the beds. The total thickness of the Santa Clara Formation is unknown, but may be as much as 4500 feet in the region.

      The site is located in a tectonically active area and is surrounded on three sides by active and potentially active faults. The right lateral, strike-slip, Calaveras Fault cuts through the eastern most extension of the site. Over the ridge top to the southwest are the Silver Creek, Coyote, and Metcalf thrust faults. The Animas and Quimby high angle reverse faults are just north of the site boundary.

   b. HYDROGEOLOGY. Groundwater investigations have focused on characterization of ground water quality in Mixer and Shingle Valleys. Generally, the alluvium appears to contain unconfined and semi-confined groundwater. This situation is characteristic of fluvial deposits that contain interbedded, laterally varying materials with contrasting permeability. Saturated alluvium generally overlies damp to moist Santa Clara deposits. However, there appear to be some areas where saturated coarse-grained Santa Clara materials are in contact with saturated

alluvium, which suggests that alluvial and Santa Clara Formation deposits may be hydraulically connected in some areas. The Santa Clara Formation's ability to store and transmit water is variable and therefore, the Santa Clara Formation is considered "in-part water-bearing". Ground water in both valleys also occurs in the deeper Santa Clara Formation between 50 and 70 feet below the ground surface and appears to be isolated.

In Mixer Valley, groundwater is found in the alluvium and in limited zones of the Santa Clara Formation in the upper portion of Mixer Valley. Recharge to the alluvium in the upper portion of Mixer Valley occurs from infiltration of rainfall and from influent stream flow. It is very likely that the alluvium in the upper portion of Mixer Valley contains only one water-bearing zone that occurs near the base of the alluvium. In the Santa Clara Formation there are a few water-bearing zones which appear to have a low permeability. The shallow ground water in the Recent Alluvium occurs between 4 and 20 feet below the ground surface. In some locations there are hydraulic connections between the shallow Santa Clara and the alluvial groundwater.

In Shingle Valley, groundwater is found in the alluvium and in limited zones of the Santa Clara Formation in Upper Shingle Valley. Recharge to the alluvium in Shingle Valley occurs from infiltration of rainfall and from influent stream flow. At some locations, groundwater may be supplied to the alluvium from the Santa Clara Formation. In middle and lower Shingle valley groundwater is also recharged by spraying treated effluent from the sewage treatment plant at the site. The water table is in the Recent Alluvium and occurs between 15 to 40 feet below the ground surface. The shallow ground water flows southeast down the two valleys. Hydraulic conductivities measured in the alluvium range from 3×10^{-2} cm/sec to 2×10^{-4} cm/sec and the Santa Clara Formation measured hydraulic conductivities range from 2×10^{-3} to 1×10^{-8} cm/sec.

The CSD facility is concentrated in an area that includes three riparian systems: Shingle Creek, Mixer Creek, and Las Animas Creek. San Felipe Creek traverses the far east portion of the CSD site before flowing into Las Animas Creek to the south of the facility boundary. Shingle Creek and Mixer Creek flow through Shingle Valley and Mixer Valley respectively in a southeasterly direction. They both flow into Las Animas Creek which empties into Anderson Reservoir. The three ephemeral streams (Shingle, Mixer and Las Animas Creeks) located in the Anderson Reservoir basin are generally small streams with highly variable flows. A distinct characteristic of the creeks is the existence of subsurface stream flow in some reaches. The relation between groundwater flow and creek flow is critical and not fully defined. Historical data indicates that the creeks are gaining streams in some reaches, possibly on a seasonal basis. A gaining stream is defined as a stream which the surrounding aquifer flows into.

Currently there are four water supply wells at the site. Two of the wells are located in the Panhandle and two near U.S. Highway 101. None of the four wells are directly connected to the impacted shallow groundwater flow system at the site. The four wells are used to supply on average about 44,000 gallons per day of water to the CSD facility. The water supplied at the wells is treated at the two water treatment plants at the site. There were two agricultural water supply wells properly destroyed, one in 1988 and one in 1991, and two drinking water supply wells properly destroyed in 1989.

c. REMEDIAL INVESTIGATION AND INTERIM REMEDIAL MEASURES

i. General. Remedial investigation is essentially completed in Shingle Valley and Mixer Valley, with some data gaps in the characterization of the creeks, especially their relationship to groundwater and the various plumes, chemical identification, local plume definition at some stations, and investigation of dense non-aqueous phase liquids (DNAPLs) at the site. Closure of the aforementioned data gaps is necessary for implementing effective final remedial measures at this site. However, the volatile organic compound (VOC) plumes are defined with minor exceptions, and the Board believes that these issues can be investigated while the remediation continues. In spite of the existing data gaps in the investigation, the Board does not foresee complications with respect to remediation and recommends the adoption of the Order at this time to provide regulatory guidance for the discharger.

ii. Mixer Valley. The groundwater investigation in Mixer Valley began in 1981 and detected contaminant plumes originating from many potential sources including but not limited to historic locations of drummed storage of various solvents, two class I surface impoundments, and chemical releases. Seven source areas (stations) have been identified in Mixer Valley. They are stations 0531, 0535, 0630, 0635, 0680, 0705, and 0706.

The Mixer Valley characterization consisted of a series of investigations including the installation of 99 ground water monitoring wells with depths of up to 100 feet and 420 soil borings. The major plume currently contains concentrations up to 32,460 ppb of total volatile organic compounds in groundwater. DNAPLs may be present. The plume is approximately 3,200 feet in length and 600 feet in width. The major compounds detected are 1,1,1-trichloroethane (TCA), and trichloroethylene (TCE). Concentrations of vinyl chloride, trans 1,2-dichloroethylene (trans 1,2- DCE), 1,1-dichloroethylene (1,1-DCE), and 1,1-dichloroethane (1,1-DCA) have also been detected.

Currently, the discharger is extracting and treating groundwater from 8 of the 11 extraction wells in Mixer Valley. All extracted water, after treatment, is routed to a holding pond for reuse.

Soils are either currently being remediated or a remediation plan is under review at this time and is scheduled for implementation in the near future.

Station 0535 in Mixer Valley has been impacted by polychlorinated biphenyls (PCBs), and non-fuel petroleum hydrocarbons (TPH) in addition to VOCs. A workplan to remediate the contaminated soils has been submitted. Remedial work is scheduled to start after the end of the 1993-1994 rainy season. The need for groundwater treatment is to be assessed after the completion of soil remediation.

iii. Shingle Valley. Groundwater investigations in Shingle Valley began in 1984 and identified 3 significant plumes and several minor plumes originating from numerous potential sources including historic drum storage areas, surface impoundments, abandoned open burning areas where drums were buried, sumps, spills, and fuel tanks. The investigation has included 370 soil borings, and installation of 140 monitoring wells. Nine stations had VOC contamination in soil over 1 mg/kg, and one station had TPH diesel in soil over 1,000 ppm. The maximum concentration of total volatile organic compounds in the valley is 15,000 ppb in groundwater. DNAPLs may be present. Shingle Valley has been divided into three investigative areas. These are Upper, Middle and Lower Shingle Valley.

a.) Upper Shingle Valley (USV): Currently, the discharger is extracting and treating ground water from 14 extraction wells and one collection trench to prevent groundwater flow into Shingle Creek. All extracted water, after treatment, is routed to a holding pond for reuse.

Seven source areas (stations) have been identified in USV. They are stations 0030, 0210, 0211, 0321, 0710, 1950 and the 0070/0210 outfall. Soils with concentrations greater than 1 mg/kg at the source areas are being remediated primarily by soil vapor extraction. Bioremediation is planned for station 0710, which is impacted by diesel fuel. Investigation at stations 0030 and 0070/0210 outfall is currently taking place to further determine the extent of contaminants in soil.

The main VOC plume in Upper Shingle Valley begins in the general area of stations 0210 and 0211 and extends to the southeast to about 1,200 feet past station 1950, making the plume approximately 3,500 feet in length. The plume which spreads across the alluvial valley to the Santa Clara contact is approximately 800 feet wide. This plume may actually consist of several smaller intermingling plumes from the various identified source areas. Such intermingling can in part account for the variation in predominant chemicals across and along the plume. Preferential flow patterns within the alluvium may allow for variations in the rate of transport of chemicals from one location to another. In the upper portion of the plume, the VOCs consist primarily of TCA, TCE, PCE, DCA,

1,1-DCE and cis-1,2-DCE.

The groundwater plume in the alluvium in the vicinity of station 0710 consists of diesel fuel. The plume extends approximately 400 to 500 feet downgradient of the station and is estimated to be about 250 feet wide. Concentrations of TPH(d) as high as 700,000 ppb in groundwater have been detected, however, floating product has been present in these samples.

b.) Middle Shingle Valley (MSV): Currently, the discharger is extracting and treating groundwater from 9 extraction wells. All extracted water is treated and then routed to a holding pond for reuse.

Three source areas (stations) have been identified in MSV. They are stations 0450, 0650, and 1971. Soil remediation at 0450 has been completed. Soil vapor extraction has started at stations 0650 and 1971.

The plume in Middle Shingle Valley is approximately 4,200 feet in length and 700 feet in width. VOCs consist primarily of TCA, TCE, 1,1-DCE, cis-1,2-DCE, Freon 11, and Freon 113; but, carbon tetrachloride, chloroform, and methylene chloride have also been detected.

c.) Lower Shingle Valley (LSV): Currently, the discharger is extracting and treating groundwater from 9 extraction wells. All extracted water is treated and routed to a holding pond for reuse. Since Lower Shingle Valley is the area of the CSD site closest to the downgradient property boundary and Anderson Reservoir, groundwater characterization and corrective measures, and the relationship between groundwater and surface water are especially critical in this area. The groundwater extraction system should remediate VOCs in groundwater, prevent flow of contaminated groundwater into surface water, and prevent off site migration of contaminants. No source areas have been identified in the lower portion of LSV. Magnetic surveys conducted in LSV found a number of buried drums with various materials inside. Buried drums and some contaminated soil were subsequently removed.

The plume in Lower Shingle Valley as defined to date is irregular in shape, but is approximately 1700 feet long and 350 feet wide. VOCs consist primarily of TCE, but TCA, Freon 11, Freon 113, cis- 1,2-DCE, methylene chloride, and acetone were also detected. The leading edge of the plume is in the vicinity of the property boundary. The upgradient boundary of the plume is not fully defined.

7. **State Water Resources Control Board Resolutions**

State Board Resolution 68-16. On October 28, 1968, the State Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality

Waters in California." This policy calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses. This is based on a Legislative finding, contained in Section 13000, California Water Code, which states in part that it is State policy that "waters of the State shall be regulated to attain the highest water quality which is reasonable."

State Board Resolution 88-63. On May 19, 1988, the State Board adopted Resolution 88-63, "Sources of Drinking Water." This resolution states that all surface and groundwaters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply.

8. <u>Regional Water Quality Control Board Resolutions</u>

Regional Board Resolution 88-160. Resolution 88-160 strongly encourages the maximum feasible reuse of extracted water from ground water pollution remediations either by the discharger or other public or private water users.

Regional Board Resolution 89-39. Resolution 89-39, "Incorporation of 'Sources of Drinking Water' Policy into the Water Quality Control Plan" on March 15, 1989. This policy defines groundwater as suitable or potentially suitable for municipal or domestic supply if it: 1) has a total dissolved solids content of less than 3,000 mg/l, and 2) is capable of providing sufficient water to supply a single well with at least 200 gallons a day. For purposes of establishing cleanup objectives, the shallow/alluvial ground water zone(s) at this site qualify as potential sources of drinking water. Most portions of the deeper Santa Clara Formation groundwater do not qualify as potential sources of drinking water based on the second criteria.

9. <u>Water Quality Control Plan.</u> The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Region (Basin Plan) on December 17, 1986, and the State Board approved it on May 21, 1987. The Basin Plan contains water quality objectives for the South San Francisco Bay and contiguous surface and groundwaters.

The existing and potential beneficial uses of Anderson Reservoir, located approximately one half mile downgradient of the discharger's property, include:

a. Municipal Supply
b. Ground water recharge
c. Non - contact water recreation
d. Warm and cold water habitat
e. Wildlife habitat
f. Fish spawning

Anderson Reservoir ultimately discharges to Coyote Creek, which flows northwest to South San Francisco Bay. The existing and potential beneficial uses of Coyote Creek and tributaries include:

a. Industrial process supply
b. Water contact recreation
c. Ocean commercial and sport fishing
d. Warm fresh water habitat
e. Preservation of areas of special biological significance
f. Wildlife habitat
g. Marine habitat
h. Fish migration and spawning
i. Fresh water replenishment
j. Groundwater recharge

The existing and potential beneficial uses of the groundwater underlying and adjacent to the discharger's facilities include:

a. Industrial process water supply
b. Industrial service supply
c. Agricultural supply
d. Municipal and domestic supply

The Board amended the Basin Plan on September 16, 1992 to implement two statewide plans and again on October 21, 1992 to formalize groundwater protection and management policies, which is pending State Water Board's approval. The latter amendment describes how groundwater cleanup standards should be established. The primary objective is to maintain background, but standards should be set no higher than Maximum Contaminant Levels (MCLs), and may be set lower based on a site - specific risk assessment. The Board will consider several factors when setting cleanup standards: cost and effectiveness of cleanup alternatives, time to achieve cleanup standards, and pollutants toxicity, mobility and volume.

10. Summary of Risk Assessment. To develop final remedial actions for the site which would be protective of human health and the environment, a baseline risk assessment (BRA) and human and environmental health evaluation was performed by the discharger, similar to the method used for sites regulated under Comprehensive Environmental Response, Compensation and Liability Act (Superfund). The guidance documents used in the BRA were the 1989 and 1991 Risk Assessment Guidance for Superfund. The steps the discharger used in the human and environmental health evaluation involved determining the primary chemicals of interest and their toxicity, and identifying potential exposure pathways for both current use and hypothetical future use scenarios. Once determined, risks were calculated for carcinogenic and noncarcinogenic chemicals in soil,

water and air, and compared to the acceptable risk range.

11. Toxicity Classification for Chemicals of Interest. A total of 24 organic compounds are identified and selected as chemicals of potential concern. A list of these chemicals is included in Table 1. Benzene and vinyl chloride have been classified by EPA as known human carcinogens (Group A). Other site chemicals of potential concern have been classified as probable or potential carcinogens (Group B2). The remaining chemicals of potential concern have been shown to cause systemic toxicity in laboratory animals under certain exposure conditions.

    There are some areas where high concentrations of chemicals were detected but not identified. They are reported as unknown VOCs or semi-volatile organic compounds (SVOCs).

12. Exposure Assessment. Under current use of the site, individuals working on the site may be exposed to site-related contaminants through two mechanisms: 1) direct contact with surface soil and 2) inhalation of volatiles emanating from groundwater and diffusing through soils into the air. Due to the remoteness of the site and strong security enforced at the facility, it is unlikely that the general public would be exposed to the same. Without continued remedial efforts, groundwater contamination could migrate off site and could directly affect Anderson Reservoir which is a major source of drinking water. In addition to human populations residing near the site, cattle are known to graze in these areas. Significant contact with surface water present on-site is not expected to occur under current conditions, but is possible at off-site locations.

    If changes in site use should occur in the future, the shallow groundwater could be used for domestic purposes. Therefore individuals inhabiting future on-site residences, should remediation discontinue, could be exposed to chemicals through 1) direct contact with surface soil 2) inhalation of volatiles emanating from groundwater and diffusing through soils into the air and 3) domestic use of contaminated groundwater. It is also possible that the groundwater contamination, if not remediated and contained, could migrate off site and could directly affect Anderson Reservoir which is a major source of drinking water. In addition, it is possible that under future conditions, individuals could come into contact with contaminants in the creeks at either on-site or off-site locations.

13. Risk Characterization. To quantitatively assess the potential risks to human health associated with the current use and future use exposure scenarios, exposure point concentrations were used to calculate chronic daily intakes (CDIs) in the case where no further remediation occurs. For recognized and/or potential carcinogens, excess lifetime cancer risks are obtained using CDI and the contaminants slope factor. In the National Contingency Plan, EPA recommends that the excess acceptable carcinogenic risk resulting from exposure to site contaminants not exceed a range from 10^{-6} to 10^{-4}.

    For noncarcinogens the potential adverse health effects are assessed by calculating

Hazard Quotient (HQ), or the ratio of the CDI to reference dose (RFD). In general, if the HQ is less than 1, it is considered unlikely that exposure by that pathway would be associated with any significant health risks.

The concentrations of chemicals of potential concern in groundwater were compared to applicable, relevant, and appropriate requirements (ARARs) if available. Current chemical concentrations for several contaminants exceed Federal or State drinking water criteria. Risk is estimated for the various chemicals and investigative areas using different scenarios.

For the current use scenario, risks are estimated for potential occupational exposures to carcinogenic and noncarcinogenic contaminants identified in each of the investigative areas. Under current conditions, carcinogenic risks range from $5x10^{-10}$ for a worker in an industrial building in Lower Shingle Valley to $1x10^{-6}$ for workers in a trailer, office building or industrial building in Upper Shingle Valley. The Hazard Index for potential exposures to noncarcinogenic contaminants are less than 1 for workers in all areas.

Risks estimated for hypothetical future residential exposures range from $1x10^{-7}$ to $5x10^{-3}$ for receptors in the investigative areas and at an off-site location. Hazard indices are less than 1 for receptors off-site or in Lower Shingle Valley. Hazard indices exceed 1 in other areas.

Since the estimated risk, under the hypothetical future use scenario, from no further remediation exceeds the EPA's recommended standards, continued remediation is required. Cleanup goals are established so that once the remedial activities are completed, the proposed chemical concentrations are not expected to result in significant health risks. Cleanup goals in the risk assessment are derived based on the National Contingency Plan, Target Acceptable Risk Range (NCP TARR) according to standard guidance (RAGS/HHEM). Cleanup goals developed by these methods can be compared to cleanup goals derived by other means and to other health based criteria or benchmarks.

14. Screening of Remedial Technologies. The discharger developed and evaluated a list of possible alternatives for remediating the groundwater and soil at the UTC site. Evaluation of remedial measures reflect EPA guidance for Remedial Investigations, Feasibility Studies, and Remedial Actions. They include technical, environmental, human health, and institutional factors. Technical factors include performance (reduction of mobility, toxicity and volume), reliability, implementibility, and safety. Environmental factors include short and long term beneficial and adverse effects on environmentally sensitive areas, and measures to mitigate adverse effects. Human health factors include short- and long- term effectiveness in mitigating potential exposure and protection of human health. Institutional factors involve institutional needs for implementation of the alternative. In addition to these factors, a cost estimate was prepared for each alternative. This estimate includes direct and indirect capital cost and operation and maintenance (O&M) costs. Final detailed analyses are presented in the "RCRA Facility

Investigation/Corrective Measures Study" report prepared by the discharger. Tables 2 and 3 list a summary of corrective measures technologies which were screened for the site for groundwater and soil respectively.

15. Remedial Actions. The discharger's report titled "RCRA Facility Investigation/Corrective Measure Study" and its addendum, provide for a final cleanup plan in Operable Unit 1 (Shingle Valley and Mixer Valley). The final remedial actions are as follows:

15.a. Groundwater and Surface Water

Continued extraction and treatment of the shallow groundwater in order to prevent vertical or lateral migration of contaminants, to prevent seepage of contaminated groundwater into creeks, and to restore groundwater quality.

15.b. Soil

All identified sources will be removed or treated, to achieve soil cleanup standards. A source is defined as soils containing one or more chemicals at concentrations above the cleanup standards established for those chemicals. Soil cleanup standards are established to prevent leaching of chemicals from the soil to the underlying groundwater, and volatilization to the atmosphere.

15.c. General

Institutional controls consisting of site security, worker notification, and a deed restriction or an equivalent mechanism approved by the Executive Officer, prohibiting the use of the untreated shallow groundwater in Operable Unit 1 for drinking water. The institutional constraints will also act as a control with respect to exposure to soils and alert utility workers of potential health and safety concerns.

15.d. Alternate Groundwater Remedial Measures

The RFI/CMS does not specifically address alternate remedial measures if groundwater extraction is unable to prevent plume migration or contaminated groundwater discharge to creeks, despite evidence that such discharge may exist. The remedial actions are amended to require a plan, if necessary, to address this issue.

16. Cleanup Standards. The cleanup standards must be protective of human health and the environment. Anderson Reservoir, at its high water mark, is within one-half mile of the southern boundary of the site and is used for recreation and recharge of the groundwater

basin. It is also used as a holding area for imported surface water from San Felipe Reservoir. The groundwater basin is a major source of drinking water in the Santa Clara Valley. Due to the potential of contaminated groundwater seeping into the creeks and migrating offsite toward Anderson Reservoir, it is critical that: 1) there is no contaminated groundwater seepage into the creeks surface and subsurface flow, 2) alluvial groundwater is treated up to standards which protect the human health and the environment, 3) there is no further migration of alluvial groundwater exceeding groundwater cleanup standards, to deeper aquifers, and 4) contaminants are prevented from migrating beyond the property boundary.

The groundwater cleanup standards for the site are based on adopted or proposed U.S. Environmental Protection Agency Maximum Contaminant Levels (MCLs) and proposed or adopted California Environmental Protection Agency MCLs. The more stringent standard will be utilized. At this time it appears that cleanup of groundwater to below the MCLs may be technically impractical due to the difficulties in restoring aquifers with respect to the physical and chemical nature of the contaminants. For this reason, MCLs are acceptable to meet the intent of State Board Resolution 68-16. For those chemicals that do not have MCLs, standards were set so that the individual risk associated with the cleanup standards would be within acceptable levels.

Volatile organic compounds and other contaminants are present in the soil at several locations at the site. Two migration pathways exist: leaching from the soil to the underlying groundwater and volatilization from the soil to the atmosphere. In order for soil cleanup levels to be protective of groundwater, the maximum concentration of chemical allowable in the soils of the vadose zone must be such that soil leachate entering the underlying aquifer does not degrade the groundwater beyond proposed groundwater quality standards. The chemicals of concern in soil are the same as those in groundwater, predominantly VOCs. The presence of VOCs at high concentrations would present a continued threat to water quality. In the past, several adopted Regional Water Board Orders included cleanup standards of 1 mg/kg (ppm) total VOCs for vadose zone soils. In addition, the Basin Plan's groundwater amendment, which is pending approval by the State Water Board, recommends a cleanup standard of 1 mg/kg (ppm) for total VOCs. This standard applies to vadose zone soils only, and is based on the modeling results at a Superfund site in the Region, the existence of similar standards in the state of New Jersey, and the professional judgement of Board staff. As an alternative to this cleanup level, UTC has proposed soil cleanup standards of 1 ppm and 5 ppm total VOCs, depending on the toxicity and mobility of the VOCs at each station. Higher toxicity VOCs are defined as VOCs that have MCL/alternate concentration limit (ACL) of 5 μg/l or less, or are classified as an "A" or a "B" carcinogen (weight of evidence). They include, but are not limited to, Trichloroethylene (TCE), Vinyl Chloride, 1,1-dichloroethane (DCA), and Perchloroethylene (PCE). Lower toxicity VOCs are defined as VOCs that have MCL/ACLs higher than 5 μg/l, or are classified as a "C" or a "D" carcinogen (weight of evidence). They include, but are not limited to, Acetone, 2-Butanone (MEK), cis,1-2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE),

Freon 11, Freon 113, and 1,1,1-trichloroethane (TCA).
PCB contamination exists at station 0535 and is commingled with the VOC plume in that area. It is possible that PCBs have been mobilized at this station. The cause of the mobilization is either the heating oil or the VOCs present at this station. It is important that VOCs and the heating oil be treated expeditiously to prevent further mobilization of PCBs. PCB concentration in groundwater will be reduced to 0.5 ppb which is the MCL for PCBs. In soil, the discharger's risk assessment report proposes a cleanup goal range of 0.3 mg/kg to 30 mg/kg of total PCBs. This range is based on potential direct soil exposure at station 0535 assuming this area is once again active, with no exposure restriction for workers, and corresponds to 10^{-6} to 10^{-4} increased cancer risk with lifetime exposure. Federal Toxic Substance Control Act (TSCA) regulations establish 10 mg/kg of PCBs for unrestricted access areas and 25 mg/kg of PCBs for restricted access areas. Since PCBs have been mobilized, the lower limit of 0.3 mg/kg proposed in the risk assessment report is established to protect public health and prevent further degradation of water quality. However, if the discharger demonstrates that higher concentrations of PCBs can be left in soil without leaching into groundwater, higher cleanup levels of up to 10 mg/kg established by TSCA will be applied to soils deeper than 3 feet below surface.

Diesel fuel contamination exists at station 0710. Cleanup levels for diesel in soil and groundwater are based on best professional judgement. Due to proximity of the plume to the creek and potential impacts to aquatic life in the creek, a groundwater cleanup standard of 100 ppb, based on EPA's Suggested No-Adverse Response Levels (SNARL), is established. A soil cleanup standard of 500 mg/kg based on past actions by the Board is established. If the discharger demonstrates through site specific field investigation that higher levels of diesel can be left in place, without threatening the quality of waters of the State, these standards may be modified.

17. Local creeks provide a potential conduit to carry VOCs and other contaminants toward Anderson Reservoir. There are indications that groundwater and surface water are in contact, and therefore contaminants are detected in surface waters. Preventing or minimizing contaminants in surface waters is a high priority, in order to prevent the spread of contaminants and protect this existing beneficial use. In addition, excessive concentrations of VOCs in creeks could cause acute or chronic toxicity to aquatic life. It is appropriate to prohibit detectable concentrations of contaminants in surface waters at or beyond the property boundary, in order to assure protection of the existing beneficial use downstream. It is appropriate to allow low concentrations of contaminants in on-site surface waters, provided that these concentrations do not exceed groundwater cleanup standards and are protective of freshwater aquatic life. Based on current data, achieving non-detect in on-site surface waters may be infeasible.

18. The discharger has caused or permitted, and threatens to cause or permit, waste to be discharged or deposited where it is or probably will be discharged to waters of the State and creates or threatens to create a condition of pollution or nuisance. Containment and

cleanup measures need to be continued to alleviate the threat to the environment posed by the continued migration of pollutants.

19. This action is an Order to enforce the laws and regulations administered by the Board. This action is categorically exempt from the provisions of CEQA pursuant to Section 15321 of the Resources Agency Guidelines.

20. The Board has notified the discharger and all interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharger and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

21. The Board, at a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED, pursuant to Section 13304 of the California Water Code that the discharger shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge, storage, or treatment of wastes or materials in a manner which will degrade water quality or adversely affect beneficial uses of the ground and surface waters of the State is prohibited.

2. Further significant migration of pollutants through surface or subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of pollutants are prohibited.

4. The discharge of contaminated groundwater into creeks and surface water is prohibited. Specifically, no detectable concentrations of contaminants shall be allowed in surface waters at or beyond the property boundary, and no concentrations of contaminants in excess of Table 4 cleanup standards shall be allowed in on-site surface waters. Further, phenol concentrations in on-site surface waters shall not exceed 2,560 ppb, in order to protect freshwater aquatic habitat.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of polluted soil or groundwater shall not create a nuisance as defined in Section 13050(m) of the California Water Code.

2. The discharger shall conduct appropriate monitoring activities. Should monitoring results show evidence of pollution migration beyond that already identified, additional plume characterization of pollutant extent may be required.

3. The discharger shall implement the remedial actions described in Finding 15.

4. The schedule for interim remediation activities should lead to startup of remaining interim remediation activities no later than SEPTEMBER 30, 1995.

5. **Cleanup standards:** Final groundwater cleanup standards given in Table 4 shall be met at all existing and future wells monitored pursuant to the Self-Monitoring Program except Santa Clara Formation wells yielding or predicted to yield less than 200 gallons a day of water. The yield determination should be made at the time that the discharger proposes extraction well curtailment for a given area. Remediation of vadose zone soils will be per the final soil cleanup standards given in Table 5.

6. If additional information indicates that cleanup standards cannot be attained or can be surpassed, the Board will decide if further final cleanup actions, beyond those completed, shall be implemented or if alternate cleanup standards are appropriate at this site. If changes in health criteria, administrative requirements, site conditions, or remediation efficiency occur, the discharger will submit an evaluation of the effects of the changes on cleanup standards as defined in Specification B.5.

7. **Cost recovery:** Pursuant to Section 13304 of the Water Code, the discharger is hereby notified that the Board is entitled to, and may seek reimbursement for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial action, as required by this Order. The discharger shall reimburse the Board within 30 days of receipt of a billing statement for those costs.

C. PROVISIONS

1. The discharger shall perform all investigations and remedial work in accordance with requirements of this Order.

2. The discharger shall submit to the Board acceptable monitoring program reports containing results of work performed according to the attached Self-Monitoring Program.

3. The discharger shall comply with all Prohibitions and Specifications of this Order, in accordance with the following tasks:

a. Additional Investigation

TASK 1: Report on Additional Soil and Groundwater Investigation
COMPLETION DATE: January 31, 1996

Submit a technical report acceptable to the Executive Officer which documents completion of the data gaps at all stations in Operable Unit 1 where investigation may be incomplete as identified in the November 24, 1993 Board staff comments on the RFI/CMS and RFI/CMS addendum.

TASK 2: Investigation of Surface Water Hydrology
COMPLETION DATE: August 1, 1994

Submit a workplan acceptable to the Executive Officer containing a proposal and schedule for investigating surface water hydrology in order to develop a system to monitor the associated interactions between the groundwater and surface water in areas of concern. Such an investigation shall include, but not be limited to, pertinent water level data, locations of creek and creek under flow sampling and gauging stations, associated wells, and the rationale for selection, information regarding the location of the wells with respect to the creek (distance to the creek, ground surface elevation), chemical concentrations in the wells, and detailed groundwater contour maps on the appropriate topographic base map, and impact of groundwater remediation on the riparian habitat.

TASK 3: Report on Surface Water Hydrology
COMPLETION DATE: According to Schedule in Task 2 Approved by the Executive Officer

Submit a technical report acceptable to the Executive Officer which documents the completion of the tasks proposed in the workplan submitted in Task 2. The report shall include, but not be limited to, discussion of the interaction between groundwater and creek flow, occurrence and significance of creek underflow (creek water moving through the gravel in the creek bed), seeps and springs; identification of losing and gaining reaches of the creeks, and chemical analysis to be performed on creek samples. This report shall also include a plan for sampling the creeks including, but not limited to, chemical analyses and water level sampling schedules, and the rationale. The creek monitoring program plan may be combined with the annual environmental monitoring program plan.

b. Groundwater Remediation

TASK 4: Evaluate Effectiveness of Hydraulic Containment
COMPLETION DATE: October 30, 1994

Submit a technical report acceptable to the Executive Officer which evaluates the effectiveness of the hydraulic containment system. Such an evaluation shall include, but not be limited to, an estimation of the capture zone of the extraction wells, pump rates and pump cycles for extraction wells, establishment of the cones of depression by field measurements; presentation of historical chemical monitoring data, discussion of significant increases or decreases and unusual trends in chemical concentrations, and the most recent plume maps with chemical concentrations indicated; groundwater and surface water elevation data. A map at an appropriate scale shall be included in the report that superimposes the capture zone on the contaminant plume for all affected areas.

TASK 5: Design for Expanded Groundwater Extraction and Treatment System
COMPLETION DATE: February 28, 1995

In the event that the report requested in Task 4 determines that the existing groundwater extraction system is not adequately containing the plumes, based on the criteria established in Finding 15 and elsewhere in this Order, submit a technical report acceptable to the Executive Officer which contains the design for the expanded groundwater treatment and extraction system for the alluvial/shallow zone aquifer. This document shall include, but need not be limited to modeling and/or rationale for any proposed extraction well location, a map of the well configuration, an estimate of the capture zone that can be established by the wells, the rate of pumping that will be required, re-capture for periods when pumps are off, map estimating position of Qsc and Qal contact beneath the valley alluvium, and how the performance of the system will be evaluated. The document should include information on the time required for equipment acquisition, estimated time for system construction, and projected date of implementation.

The Executive Officer may modify the completion date of Task 5 if the discharger demonstrates to the satisfaction of the Executive Officer that additional time is necessary to complete the design due to delays outside the reasonable control of the discharger.

If the discharger determines that expanding the groundwater extraction system is not the most effective approach, then upon approval of the Executive Officer, the discharger may propose an alternate remedial

measure according to task 9.

TASK 6: Implementation of the Expanded Groundwater Extraction and Treatment System

COMPLETION DATE: According to Schedule in Task 5 Approved by the Executive Officer

Submit a technical report acceptable to the Executive Officer which documents the completion of the tasks identified in the technical report submitted for Task 5.

TASK 7: Proposal to Curtail Groundwater Extraction

COMPLETION DATE: 90 Days Prior To Proposed Extraction Well Pumping Curtailment

Submit a technical report and implementation schedule acceptable to the Executive Officer containing a proposal for curtailing pumping from groundwater extraction well(s) and the criteria used to justify such curtailment. Curtailment of groundwater extraction may include, but is not limited to: final shutdown of the system, phased approach to shutdown, pulsed pumping, or a significant change in pumping rates. The report shall include the rationale for curtailment or modifying the system. This report shall also include data to show that cleanup standards for chemicals of concern have been achieved and have stabilized or are stabilizing, and that the potential for contaminant levels rising above cleanup standards is minimal. This report shall also include an evaluation of the potential for contaminants to migrate into the creeks surface or subsurface flow, and downwards to the Santa Clara Formation aquifers.

All system modifications to the extraction and treatment systems are subject to approval by the Executive Officer. This requirement may be waved by the Executive Officer if deemed appropriate.

If the discharger claims that it is not technically feasible to achieve cleanup standards, the report shall evaluate the alternative standards that can be achieved, and demonstrate that the alternative cleanup standards proposed will be protective of human health and the environment.

TASK 8: Completion of Extraction Well Curtailment

COMPLETION DATE: According to Schedule in Task 7 Approved by the Executive Officer

Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 7.

TASK 9: Proposal For An Alternate Remedial Plan
COMPLETION DATE: 90 Days After Executive Officer Notifies The Discharger To Proceed With This Task

If the Executive Officer or the discharger determines that the groundwater extraction system is not adequately containing the plumes, based on the criteria established in Finding 15 and elsewhere in this Order, a technical report acceptable to the Executive Officer shall be submitted to the Board. The report shall include a proposal for an alternate technology to contain the groundwater plume(s) and prevent off-site migration of the contaminants. The report shall include, but not be limited to, description of the alternate technology, historical and statistical data, if available, for the technology, applicability to this site, implementation schedule, impact on existing conditions, and impact on achieving the Prohibitions, Specifications, and Provisions of this Order. This report shall identify polluted groundwater and evaluate the need and alternatives for the cleanup, control and containment of a migrating groundwater pollution plume. Submit a workplan to conduct pilot or treatability studies, if applicable, for the proposed remedial action. The proposed remedial alternative shall reduce the volume, mobility, and toxicity of pollutants. The report shall include a schedule for the tasks and time schedule for implementation of the recommended remedial action.

TASK 10: Completion Of The Alternate Remedial Plan
COMPLETION DATE: According to Schedule in Task 9 Approved by The Executive Officer

Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 9.

c. Soil Remediation - Excavation

TASK 11: Soil Excavation Workplan
COMPLETION DATE: 60 Days Prior to Commencement of Activities

Submit a technical report acceptable to the Executive Officer describing any soil excavation including a description of any on-site treatment and

any off-site disposal, and a proposed implementation schedule. The requirement to submit a technical report may be waived by the Executive Officer if deemed appropriate. The report should include the results of chemical analyses of appropriate samples from source(s) areas. This report shall also include analytical limits of chemicals of concern for soils to be disposed.

TASK 12: Completion of Soil Excavation

COMPLETION DATE: 60 Days After the Completion of Soil Excavation Activities

Document in a technical report the completion of the necessary tasks identified in Task 11. This report should include the results of chemical analyses of appropriate samples from the excavation(s) and source areas. For off-site soil disposal submit the pertinent information for the disposal site (i.e. name, address and EPA identification).

d. Soil Remediation - SVE

TASK 13: Soil Vapor Extraction Workplan
COMPLETION DATE: 60 Days Prior to Commencement of Activities

Submit a technical report acceptable to the Executive Officer containing the soil vapor extraction workplan for all remaining stations in Operable Unit 1 to be remediated by this method. This report should include the proposed implementation schedule and specific system layout for each station.

TASK 14: Report on Start up of Soil Vapor Extraction
COMPLETION DATE: According to Schedule in Task 13 Approved by the Executive Officer

Document in a technical report the completion of the necessary tasks identified in Task 13. The report should include the start up dates for all soil vapor extraction systems.

TASK 15: Soil Vapor Extraction Curtailment Proposal
COMPLETION DATE: 90 Days Prior To Proposed Curtailment of Any Soil Vapor Extraction Well

Submit a technical report and implementation schedule acceptable to the Executive Officer containing a proposal for curtailing operation from any

soil vapor extraction well(s) or piping and the criteria used to justify each curtailment. This report shall include a proposal indicating the locations of borings and sampling interval to determine concentrations of VOCs remaining in soil. The proposal may include the temporary termination of vapor extraction well operation for an extended period of time to study the effects on chemical migration prior to well destruction.

If the discharger claims that it is not practicable to achieve soil cleanup standards through continued soil vapor extraction in all or any portion of the soil plume area and that significant quantities of chemicals are not being removed through soil vapor extraction, the discharger shall evaluate the reductions in chemical concentrations and the alternative soil cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving soil cleanup standards and whether conditions for waiving these standards are met (e.g., that meeting the soil cleanup standards is technically impracticable from an engineering perspective) and that the alternative soil cleanup standards proposed will be protective of human health and the environment.

Task 16: Completion of Soil Vapor Extraction Curtailment
COMPLETION DATE: According to Schedule in Task 15 Approved by the Executive Officer

Document in a technical report the completion of the necessary tasks identified in Task 15. This report should include the results of chemical analyses of appropriate verification samples from the source areas, and copies of well destruction completion notices.

e. Soil Remediation - Bioremediation

TASK 17: Soil Bioremediation Curtailment Proposal
COMPLETION DATE: 90 Days Prior To Proposed Curtailment of Any Bioremediation System

Submit a technical report and implementation schedule acceptable to the Executive Officer containing a proposal for curtailing bioremediation and the criteria used to justify curtailment. This report shall include a proposal indicating the locations of verification borings and sampling interval to determine concentrations of TPH diesel and BTEX remaining in soil. The proposal may include the temporary termination of bioremediation operation for an extended period of time to study the effects on chemical migration prior to system abandonment.

If the discharger claims that it is not practicable to achieve soil cleanup

standards through continued bioremediation in all or any portion of the soil plume area and that significant quantities of chemicals are not being removed through bioremediation, the discharger shall evaluate the reductions in chemical concentrations and the alternative soil cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving soil cleanup standards and whether conditions for waiving these standards are met (e.g., that meeting the soil cleanup standards is technically impracticable from an engineering perspective) and that the alternative soil cleanup standards proposed will be protective of human health and the environment.

TASK 18: Completion of Bioremediation Curtailment
COMPLETION DATE: According to Schedule in Task 17 Approved by the Executive Officer

Document in a technical report the completion of the necessary tasks identified in Task 17. This report should also include the results of chemical analyses of appropriate verification samples from the source areas.

f. Institutional Constraints

TASK 19: Proposed Constraints
COMPLETION DATE: June 30, 1994

Submit a technical report acceptable to the Executive Officer documenting procedures to be implemented by the discharger, including a deed restriction prepared and filed by United Technologies Corporation prohibiting the use of the untreated shallow groundwater in Operable Unit 1 as a source of drinking water. The Executive Officer may approve an alternative mechanism if it accomplishes the same function as a deed restriction. The report shall also describe the procedures to be used to ensure worker safety and maintain site security. Constraints shall remain in effect until groundwater cleanup standards have been achieved.

TASK 20: Constraints Implemented
COMPLETION DATE: 60 Days After Board's Approval of Task 19

Submit a technical report acceptable to the Executive Officer documenting that the proposed and approved constraints have been implemented.

g. Other Reports

TASK 21: Five Year Status Report and Effectiveness Evaluation
COMPLETION DATE: May 31, 1999

Submit a technical report acceptable to the Executive Officer containing the results of any additional investigation; an evaluation of the effectiveness of installed final cleanup measures and cleanup costs; additional recommended measures to achieve final cleanup levels, if necessary; and the tasks and time schedule necessary to implement any additional final cleanup measures. This report shall also evaluate DNAPLs at the site; their presence or likelihood of presence based on monitoring data, affects on remediation, and options for control or remediation of DNAPLs. This report shall also describe the reuse of extracted groundwater and evaluate and document the cleanup of contaminated groundwater. If cleanup standards in this Order have not been achieved on-site and are not expected to be achieved through continued groundwater extraction and/or soil remediation, this report shall also contain an evaluation addressing whether it is technically practicable to achieve the cleanup standards, and if so, a proposal for procedures to do so. This report shall also include cumulative water level and analytical data for the five year period.

TASK 22: Evaluation of New Health Criteria
COMPLETION DATE: 180 Days After Request Made by the Executive Officer

Submit a technical report acceptable to the Executive Officer which contains an evaluation of how the final plan and cleanup standards would be affected, if the concentrations as listed in Specification B.5. change as a result of promulgation of revised drinking water standards, maximum contaminant levels or action levels or other health based criteria.

TASK 23: Evaluation of New Technical Information
COMPLETION DATE: 180 Days After Request Made by the Executive Officer

Submit a technical report acceptable to the Executive Officer which contains an evaluation of new technical and economic information which indicates that cleanup standards or cleanup technologies in some areas may be considered for revision. Such technical reports shall not be required unless the Executive Officer or Board determines that such new information indicates a reasonable possibility that the Order may need to be changed under the criteria described in Specification B.6.

4. The submittal of technical reports evaluating interim and final cleanup measures will

include a projection of the cost, effectiveness, benefits, and impact on public health, welfare, and environment. These evaluations should be consistent with the guidance provided by Subpart F of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300); Section 25356.1 (c) of the California Health and Safety Code; CERCLA guidance documents; and shall be consistent with the State Water Resource Control Board's Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California."

5. If the discharger is delayed, interrupted or prevented from meeting one or more of the completion dates specified in this Order, the discharger shall promptly notify the Executive Officer. In the event of such delays, the Board may consider modification of the task completion dates established in this Order.

6. On an annual basis beginning on January 1, 1995, or as required by the Executive Officer, an annual report shall be submitted to the Board, within 6 workweeks after the beginning of the year, evaluating the progress of cleanup measures. This report can be part of the fourth quarter report. The first annual report shall include a summary of cumulative water levels and analytical data at the site. The report should propose additional interim remedial actions, if necessary to achieve compliance with the Prohibitions of this Order with a schedule for implementation.

7. If deemed necessary or upon request of the Executive Officer the discharger shall submit revised Quality Assurance Project Plans, Site Safety Plans, and Site Sampling Plans. Each revised report shall be submitted within 60 days from the date of staff comments on the draft report.

8. All technical reports or documents which contain hydrogeological plans, or engineering specifications, shall be signed by or stamped with the seal of a registered geologist, engineering geologist or professional engineer who was in responsible charge of the work, and who certifies the completeness and accuracy of the respective data or information being submitted under their charge.

9. All information regarding contamination or potential contamination, known or discovered during routine inspection, sampling and analyses, investigations, and/or remedial activities shall be reported in the quarterly report which is due following the discovery.

10. All reports, plans and documents shall be signed by a principal officer of the corporation or a duly authorized representative, who certifies the completeness and accuracy of the report, and shall contain the following statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly

responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

11. All samples shall be analyzed by State certified laboratories or laboratories accepted by the Board using approved EPA methods for the type of analysis to be performed or other methods approved by the Board. All laboratories shall maintain quality assurance/quality control records for Board review. The discharger shall maintain the certified analytical results for five years, and make them available to the Board upon request.

12. The discharger shall operate and maintain in good working order, and operate efficiently, any facility or control system installed by the discharger to achieve compliance with the requirements of this Order.

13. A copy of all correspondence, reports, and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided in full, to the following agencies:

    a. Santa Clara Valley Water District
    b. U.S. Environmental Protection Agency, Region IX

    The discharger shall provide a copy of cover letters, title pages, table of contents and the executive summaries of above compliance reports - except for the annual progress reports, workplans for groundwater remediation, and workplans for soil remediation which shall be submitted in full to the following agencies:

    a. Santa Clara County Department of Environmental Health
    b. California EPA/DTSC Site Mitigation Branch

    The Executive Officer may require an additional copy of correspondence, reports and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order to a local repository for public use.

14. The discharger shall permit the Board or its authorized representatives, in accordance with Section 13267(c) of the California Water Code:

    a. Entry upon premises in which any pollution exist, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

    b. Access to copy any records required to be kept under the terms and conditions of this Order.

c. Inspection of any monitoring equipment or methodology implemented in response to this Order.

d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.

15. The discharger shall provide written notification of any changes in site occupancy and ownership associated with the facility described in this Order within one month of such changes.

16. If any hazardous substance as defined in California Code of Regulations, Title 22, is discharged in or on any waters of the State, or discharged and deposited where it is, or probably will be discharged in or on any waters of the State, the discharger shall report such discharge to this Board, at (510) 286-1255 on weekdays during office hours from 8 AM to 5 PM, and to the Office of Emergency Services at (800) 852-7550 during non-office hours. Verbal notification is required within 3 hours of discovery of the spill, and a written report shall be filed with the Board within five (5) working days and shall contain information relative to: the nature of the waste or pollutant, quantity involved, duration of incident, cause of spill, Spill Prevention, Control and Countermeasure Plan (SPCC) in effect, if any, estimated size of affected area, nature of effects, corrective measures that have been taken or planned, and a schedule of these activities, and persons notified.

17. The updated waste discharge requirement (Order 89-008) for this site remains in effect, but their requirements for site investigation and cleanup in Shingle Valley and Mixer Valley are superseded by this Order. The Board will consider updating Order 89-008 at a future date.

18. The Board will review this Order periodically and may revise the requirements when necessary.

I, Steven R. Ritchie, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on May 18, 1994.

Steven R. Ritchie
Executive Officer

Attachments: Tables 1 - 5
Site Maps
Self-Monitoring Program

TABLE 1
CHEMICALS OF POTENTIAL CONCERN

CHEMICALS	GROUNDWATER	SOIL
Acetone		X
Benzene	X	
Chlorobenzene		X
Chloroform	X	
Carbon tetrachloride	X	
1,1-Dichloroethene (DCE)	X	X
1,1-Dichloroethane	X	X
cis-1,2-Dichloroethene	X	X
1,2-Dichloroethane	X	X
Ethylbenzene		X
Freon 113	X	X
Freon 11	X	
Methyl ethyl ketone (MEK) (2-Butanone)		X
Methylene Chloride (Dichloromethane)		X
Phenols	X	
Perchloroethylene (PCE) (Tetrachloroethylene)	X	X
Polychlorinated biphenyls (PCBs)	X	X
Perchlorates *		X
Trichloroethylene (TCE)	X	X
TPH-diesel	X	X
1,1,1-Trichloroethane (TCA)	X	X
Toluene		X
Vinyl Chloride	X	X
Xylenes		X

* Cleanup standards for perchlorates will be established upon completion of the discharger's investigation of the extent of perchlorate contamination, and further guidelines on cleanup levels.

TABLE 2
SUMMARY OF CORRECTIVE MEASURES TECHNOLOGIES FOR VOCs IN GROUNDWATER

OPTION	DESCRIPTION
Slurry Walls	Containment or diversion.
Vibrating Beam Walls	Containment or diversion.
Sheet Pile Walls	Containment or diversion.
Gradient Controls	Diversion.
Extraction Wells	Extraction of groundwater.
Drainage Trenches	Collection and extraction of groundwater.
Air Stripping	Mass transfer of VOCs to air stream.
Liquid-Phase GAC	Adsorption of VOCs onto activated carbon.
Steam Stripping	Mass transfer of VOCs to steam stream.
Fractional Distillation	Makes use of different boiling points of individual VOCs and water.
Liquid Evaporation	Selective evaporation of VOCs from water.
Liquid-Liquid Extraction	VOCs adsorbed by liquid solvent.
Critical Fluid Extraction	Mass transfer of VOCs to supercritical CO2.
Ultraviolet Photolysis	Includes chlorine cleavage and oxidation.
UV-Oxidation	Includes chlorine cleavage and oxidation.

TABLE 3
SUMMARY OF CORRECTIVE MEASURES TECHNOLOGIES FOR SOIL

OPTION	DESCRIPTION
Soil Leaching	In situ leaching of soil with water and/or surfactants and solvents; in conjunction with groundwater pumping.
Biodegradation	In situ metabolism of contaminants with or without introduction of nutrients, oxygen and/or microorganisms to the soil.
Bioventing	In situ metabolism of contaminants enhanced by the pumping or drawing of air through the soil.
Volatilization	Vacuum extraction of soil strips VOCs.
Off-Site Disposal	Excavate and haul to landfill.
Low Temperature Thermal Stripping	Excavate and treat.
Off-Site High Temperature Incineration	Excavate and haul to incinerator.
Soil Washing	Excavate and treat.

TABLE 4
GROUNDWATER CLEANUP STANDARDS (μg/l)

Chemical	Cleanup Standards	Weight of Evidence [1]	Basis
Acetone	3,500	D	DWEL[2]
Methyl ethyl ketone (MEK) 2-Butanon	1,750	D	DWEL
Benzene	1	A	CALIF. 1° [3] MCL
Chlorobenzene	30	D	CALIF. 1° MCL
Chloroform	100	B2	EPA 1° MCL
Carbon tetrachloride	0.5	B2	CALIF. 1° MCL
1,1-Dichloroethene (DCE)	6	C	CALIF. 1° MCL
1,1-Dichloroethane	5	-	CALIF. 1° MCL
cis-1,2-Dichloroethene	6	D	EPA 1° MCL
1,2-Dichloroethane	0.5	B2	CALIF. 1° MCL
Ethylbenzene	680	D	CALIF. 1° MCL
Freon 113	1,200	-	CALIF. 1° MCL
Freon 11	150	-	CALIF. 1° MCL
Methylene Chloride (Dichloromethane)	5	B2	EPA 1° MCL
Phenol	21,000	D	DWEL
Perchloroethylene (PCE) (Tetrachloroethylene)	5	B2	EPA 1° MCL
Polychlorinated biphenyls (PCBs)	0.5	B2	EPA 1° MCL

TABLE 4 (Continued)
GROUNDWATER CLEANUP STANDARDS (μg/l)

Chemical	Cleanup Standards	Weight of Evidence	Basis
Trichloroethylene (TCE)	5	B2	EPA 1° MCL
TPH-diesel	100	-	SNARL[4]
1,1,1-Trichloroethane (TCA)	200	D	EPA 1° MCL
Toluene	1,000	D	EPA 1° MCL
Vinyl chloride	0.5	A	CALIF. 1° MCL
Xylenes	1,750	D	CALIF. 1° MCL

Notes:

[1] Weight of Evidence, EPA's guidelines for carcinogen risk characterization.

Group A - Human Carcinogen
Group B - Probable Human Carcinogen
Group C - Possible Human Carcinogen
Group D - Not Classified as to Human Carcinogenicity
Group E - Evidence of Noncarcinoginicity for Humans

[2] Drinking water equivalent using reference dose (RFD), assuming adult mass of 70 kg and water intake of 2 liters a day.

DWEL (ppb) = RFD(μg/kg-day) x mass (kg)/Intake (l/day)= RFDx35

[3] Primary

[4] EPA's Suggested No Adverse Response Level.
This standard may be modified by the Board if the discharger demonstrates through site specific field investigation, that higher levels of diesel left in groundwater will not threaten the quality of waters of the State.

TABLE 5
SOIL CLEANUP STANDARDS mg/kg

Chemical	Cleanup Standards	Weight of Evidence[1]
Total class C or D VOCs	5	C or D
Total class A, B1, B2 VOCs	1	A,B1 or B2
PCBs	0.3*	B2
TPH diesel	500**	-

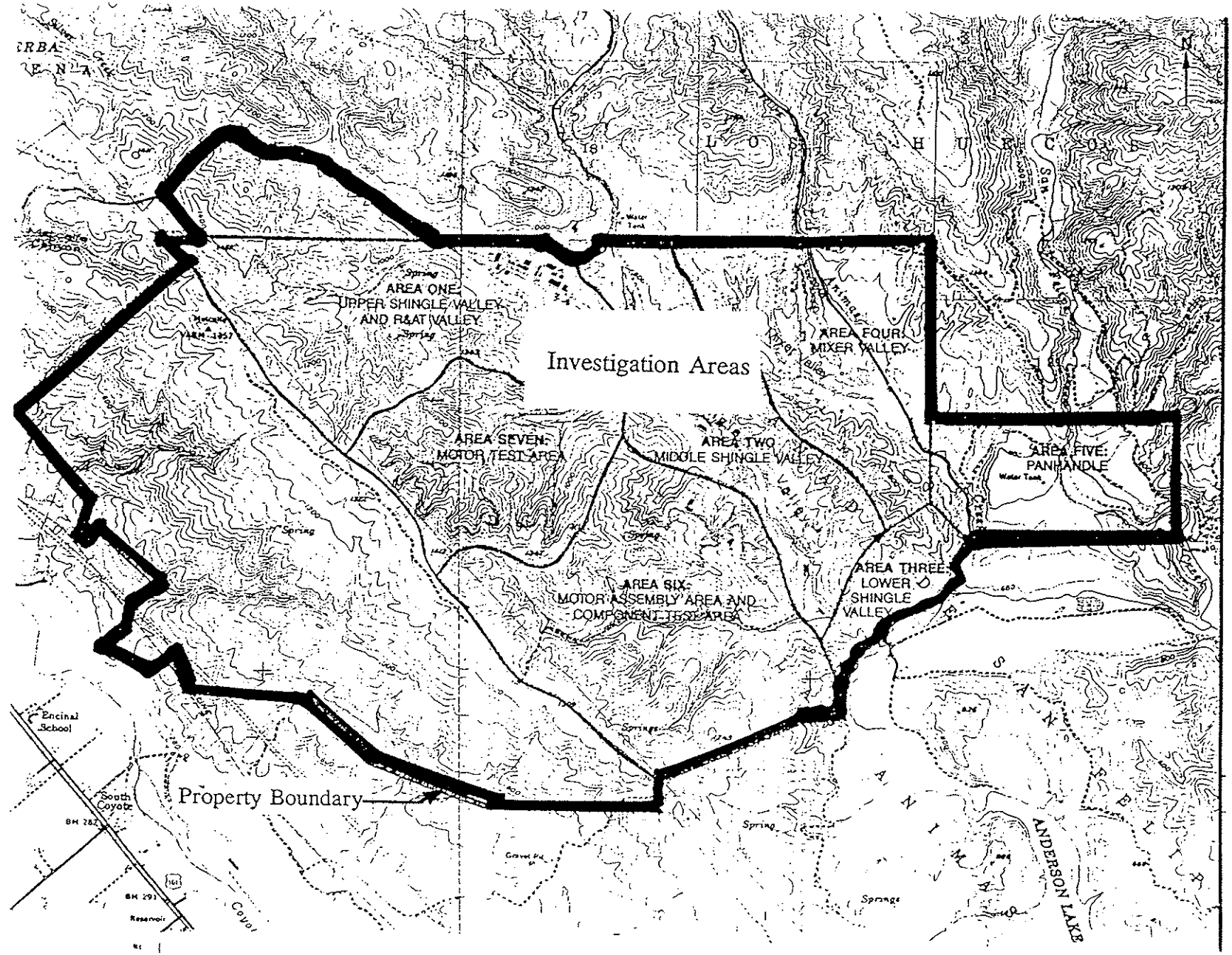
* The Executive Officer may modify this standard to a maximum of 10 mg/kg for soils deeper than 3 feet below ground surface, if the discharger demonstrates through site specific field data, that higher levels of PCBs left in soil will not degrade the quality of waters of the State.

** Based on best professional judgement based on site conditions and prior Board actions. This standard may be modified by the Board if the discharger demonstrates through site specific field investigation, that higher levels of diesel left in soil will not threaten the quality of waters of the State.

Notes:

[1] Weight of Evidence, EPA's guidelines for carcinogen risk characterization.

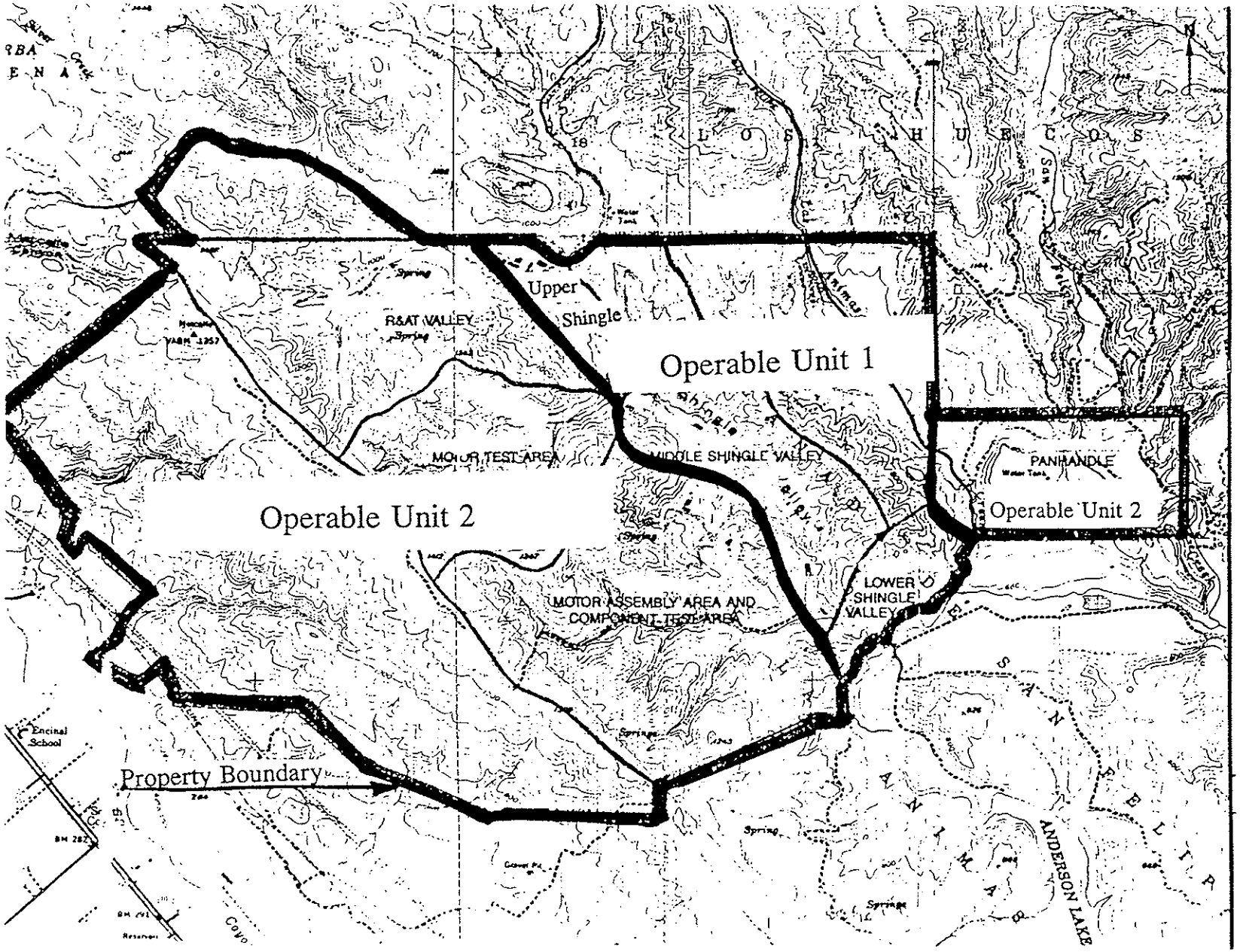
Group A - Human Carcinogen
Group B - Probable Human Carcinogen
Group C - Possible Human Carcinogen
Group D - Not Classified as to Human Carcinogenicity
Group E - Evidence of Noncarcinoginicity for Humans



SITE MAP

Figure 1

Not to Scale



OPERABLE UNITS

Figure 2

Not to Scale

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

GROUNDWATER and SURFACE WATER SELF-MONITORING PROGRAM

FOR

UNITED TECHNOLOGIES CORPORATION
CHEMICAL SYSTEMS DIVISION

600 Metcalf Road

Santa Clara County

ORDER NO. 94-064

Adopted on May 18, 1994

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

UNITED TECHNOLOGIES CORPORATION
CHEMICAL SYSTEMS DIVISION
600 METCALF ROAD

GROUNDWATER and SURFACE WATER SELF-MONITORING PROGRAM

A. GENERAL

Reporting responsibilities of waste dischargers are specified in Sections 13225(a), 13267(b), 13268, 13383 and 13387(b) of the California Water Code and this Regional Board's Resolution No. 73-16.

The principal purposes of a monitoring program by a waste discharger, also referred to as self-monitoring program, are: (1) to document compliance with waste discharge requirements and prohibitions established by this Regional Board, (2) to facilitate self-policing by the waste discharger in the prevention and abatement of pollution arising from waste discharge, (3) to develop or assist in the development of effluent or other limitations, discharge prohibitions, national standards of performance, pretreatment and toxicity standards, and other standards, and (4) to prepare water and waste water quality inventories.

B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analyses shall be performed according to the EPA Methods in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods," dated November 1986; or other methods approved and specified by the Executive Officer of this Regional Board.

C. REPORTS TO BE FILED WITH THE REGIONAL BOARD

1. Violations of Requirements

In the event the discharger is unable to comply with the conditions of the site cleanup requirements due to:

a. Maintenance work, power failures, or breakdown of waste treatment equipment, or

b. Accidents caused by human error or negligence, or

c. Other causes, such as acts of nature, or

d. Poor operation or inadequate system design,

The discharger shall notify the Regional Board office by telephone as soon as he/she or his/her agents have knowledge of the incident and confirm this notification in writing within 5 working days of the telephone notification. The written report shall include time, date, and person notified of the incident. The report shall include pertinent information explaining reasons for the noncompliance and shall indicate what steps were taken to prevent the problem from recurring.

2. Notice of Construction

The discharger shall file a written technical report to be received at least 30 days prior to advertising for bid (or 60 days prior to construction) on any construction project which would cause or aggravate the discharge of waste in violation of requirements; said report shall describe the nature, cost, and scheduling of all action necessary to preclude such discharge.

3. Self-Monitoring Reports

Written reports shall be filed regularly for each calendar quarter (unless specified otherwise) and filed according to the schedule below, starting January 1, 1995. (Monitoring reports for the remainder of 1994 shall follow the requirements established in previous Orders). If the due date falls on a Saturday or a Sunday, the report shall be due on the preceding Friday.

Quarter	1st quarter	2nd quarter	3rd quarter	4th quarter
Period	Jan-March	April-June	July-Sept	Oct-Dec
Due Date	May 21	August 21	November 21	February 21

The Self-Monitoring program reports shall summarize the status of compliance with the Prohibitions, Specifications, and Provisions of this Order.

The reports shall be comprised of the following:

a. Certification:

Monitoring reports shall contain a statement signed by a principal executive officer or a duly authorized representative of that person, certifying as follows:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate

the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

b. Executive Summary

The beginning of each report shall contain an Executive Summary which shall include a discussion of noncompliance with the Prohibitions, Specifications, and Provisions of this Order during the reporting period, explanation of noncompliance, and actions taken or planned for correcting any requirement violations. The report shall identify work not completed that was projected for completion, and shall identify the impact of non-compliance on achieving compliance with the remaining requirements of this Order. Identify any approved schedule modifications. For all points sampled, highlight laboratory analytical results if 1) a chemical that has not previously been detected is confirmed above detection limits, or 2) if the concentration of any detected chemical is at least one order of magnitude greater than detected in the previous sampling.

c. Results of Analyses and Observations

The quarterly reports shall include the following information:

(1) A cumulative tabulation of analytical results from the prior three quarters as well as analysis and observations conducted during the designated quarter, and a cumulative tabulation of construction data for all groundwater monitoring and extraction wells, shall be submitted in each quarterly self-monitoring report.

(2) A summary of remedial actions and investigations completed since the previous quarterly report, and work projected to be completed through the next quarter. Identification of potential problems which will cause or threaten to cause noncompliance with this Order and what actions are being taken or planned to prevent these obstacles from resulting in noncompliance with this Order.

(3) Appropriately scaled and labeled maps showing the location of all monitoring and extraction wells and creek sampling and gauging stations.

(4) Cumulative tabulation (four quarters) of the volume of groundwater extracted, groundwater extraction rates (pump rates), pump cycles, quarterly water level data for all wells and creek stations, the results of any additional studies (i.e. pump tests,

special studies) conducted during the quarter. An index map and cross-sections of the alluvial valley at several locations indicating contaminated groundwater and surface water levels and the interaction between them (after this information becomes available), updated water table and piezometric surface maps for all affected geologic formations based on the most recent data, (i.e. quarterly water level data from the extraction wells, monitoring wells, and creek gauging stations) shall be required semi-annually.

(5) A discussion of unexpected operational changes which could affect performance of the extraction systems, such as flow fluctuations, maintenance shutdown, etc.

(6) Identify the analytical procedures used for analyses either directly in the report or by reference to a standard plan accepted by the Executive Officer. Any special methods shall be identified and should have prior approval of the Board's Executive Officer.

(7) Identification of significant increases (a chemical that has not previously been detected or if the concentration of any chemical in any well or creek station is at least one order of magnitude greater than detected in the previous quarter). The description shall include:

a) The reason for increase,

b) How the discharger determined or will investigate the source of the increase, and

c) What source removal measures, if necessary, have been completed or will be proposed.

(8) Original lab results shall be retained and shall be made available for inspection for five years after origination or until after all continuing or impending legal or administrative actions are resolved.

(9) The annual report may be combined with the fourth quarter report. The annual report shall include an evaluation of the effectiveness of the hydraulic containment system and other remedial measures. The following information shall be included in the annual report: tabular and graphical summaries of historical monitoring data to include minimum, maximum, median, and average water quality data for all chemicals of concern for the year, a summary of water level data, and results of soil analyses. Updated plume maps for key contaminants in all geologic formations based on the most

recent available data, cross-section of the valley at several locations indicating contaminated groundwater and surface water levels and the interaction between them, after this information becomes available, new soil borings and groundwater monitoring well installation logs, summary of purge data sheets for newly developed wells, appropriately scaled topographic maps, location of wells and new soil borings, an evaluation of wells and their potential as conduits for the vertical migration of pollutants, description of site hydrogeologic conditions; evaluation of the extent to which soil pollution may be contributing to groundwater pollution, an estimation of the flow capture zones of the extraction wells, establishment of the cones of depression by field measurements, evaluation of the effects of operation of existing extraction wells on groundwater levels, and an estimate of the amount of chemicals removed via the extraction systems.

(10) Chemicals detected and confirmed per the EPA Method requirements at a well or a creek station shall be identified and reported in the quarterly reports. When a new chemical is detected and confirmed, all pertinent information including, but not limited to, the contaminant's chemical and physical properties, the source of the new chemical, possible impacts on existing soil or groundwater treatment method(s) utilized at that location, and method of treatment shall be discussed.

4. SMP Revisions

Additional long term or temporary changes in the sample collection frequency and routine chemical analysis may become warranted as monitoring needs change.

The discharger is required to submit a Monitoring Program Plan on an annual basis with the first one due on October 1, 1994, for implementation on January 1, 1995 to reflect all changes in the sampling program. The plan shall include but not be limited to specific sampling frequency and analyses performed on groundwater and surface water, and the rationale, sampling procedures and protocol, and quality assurance/quality control information.

These changes shall be proposed in a quarterly report or the annual Monitoring Program Plan, whichever is appropriate. The changes shall be implemented no earlier than 45 days after the report is submitted for review unless approved in writing.

Self-monitoring reports may be revised based on the following criteria:

(1) Discontinued analysis for a routine chemical parameter for a specific well after a two year period of below detection limit values for that parameter.

(2) Changes in sampling frequency for a specific well after a two-year period of below detection limit values for all chemical parameters from that well.

(3) Temporary increases in sampling frequency or changes in requested chemical parameters for a well or group of wells because of a change in data needs (e.g., evaluating groundwater extraction effectiveness or other remediation strategies).

(4) For EPA Methods 8240 and 8270 an attempt will be made to identify any unidentified chromatographic peak that is larger than 10% of the nearest internal standard (up to a maximum of 20 peaks). Based on how well the spectrum of the unidentified peak fits the National Bureau of Standards library compounds, the peak may be tentatively identified or it may be listed as unknown.

(5) Alter sampling frequency or sampling methods based on evaluation of collective data base.

D. SCHEDULE OF SAMPLING AND ANALYSES

1. All new wells shall be sampled on a quarterly basis for the first year. The analyses to be performed will essentially depend on the location of the wells. The sampling frequency may be modified after one year depending on the results for the first year. All non-detect wells which establish plume boundaries shall be tested quarterly for the appropriate chemicals. EPA method 8010 or 8240 or equivalent methods, pH, and turbidity tests shall be required for all new monitoring and extraction wells. Other tests such as EPA method 8270 or an equivalent method, and TPH-d shall be required for some wells, depending on the well location. (Specific groundwater sampling programs shall be per the Monitoring Program Plan due on an annual basis).

   Creeks shall be sampled according to the schedule in the creek sampling plan to be submitted according to Tasks 2 and 3 of the Provisions of this Order. The analyses performed on creek and creek underflow sampling stations will be the same EPA method applied at the associated wells. EPA methods 8010 or 8240, 8270, 9060, pH, nitrates, sulfates, and specific conductance testing shall be required for the creeks, depending on the location of the sampling station.

2. If an analysis identifies a significant increase (a chemical that has not previously been detected is confirmed above detection limits, or if the concentration of any chemical is at least one order of magnitude greater than detected in the previous sampling) in a pollutant concentration from a well or a creek sampling station, a second sample shall be taken within a week after the results from the first sample are available.

3. Groundwater elevations shall be obtained on a quarterly basis from all wells and

creek gauging stations at the site and submitted in the quarterly report with the sampling results.

4. Well depths shall be determined on an annual basis and compared to the depth of the well as constructed. If greater than twenty five percent of screen is covered, the discharger shall clear the screen by the next sampling.

5. If turbidity in a well does not stabilize to within 15% relative percent difference for two consecutive purges, the well will be redeveloped. If stabilization does not occur after redevelopment, the acceptability of chemical results from turbid wells will be evaluated on an individual basis.

6. Chemical detection limits shall be lower than cleanup standards established in the Order, unless it is technically impractical to achieve detection limits lower than cleanup levels.

I, Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data and document compliance with site cleanup requirements established in Regional Board Order No. 94-064.

2. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger, and revisions will be ordered by the Executive Officer or Regional Board.

3. Was adopted by the Board on May 18, 1994.

5/18/94
Date

Steven R. Ritchie
Executive Officer